

Tropical Cyclone Report  
Tropical Storm Carlos  
26-27 June 2003

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Carlos made landfall near Puerto Escondido, Mexico with sustained wind speeds estimated at 55 kt.

a. Synoptic History

Carlos formed from a tropical wave that moved off of the coast of Africa on 14 June. The wave was almost indiscernible on satellite imagery during its eight-day crossing of the tropical Atlantic Ocean and Caribbean Sea. On 23 June, however, it developed into an identifiable area of disturbed weather south of the Gulf of Tehuantepec. Drifting northwestward, the convection was sufficiently well-organized to assign tropical depression status early on 26 June. This was the third tropical cyclone of the eastern Pacific season. The “best track” chart of the tropical cyclone’s path is given in Fig. 1, and the wind and pressure histories are shown in Figs. 2 and 3, respectively. The best track positions and intensities are listed in Table 1.

Still embedded in weak steering currents, the depression drifted slowly and erratically northward and strengthened. It became Tropical Storm Carlos at 1200 UTC on 26 June, while centered about 90 n mi southwest of Puerto Angel, Mexico. Continuing slowly northward, Carlos strengthened to an estimated 55-kt tropical storm before its center reached the coast of Mexico about 50 n mi west of Puerto Escondido early on the next day.

Carlos quickly weakened below tropical storm intensity on the 27<sup>th</sup> as its circulation encountered the high terrain of Mexico. The depression began a slow westward drift on the 27<sup>th</sup>, in response to weak steering from a deep-layer-mean ridge over Mexico. It drifted west to west-southwestward, moving back over the eastern Pacific waters for about 24 hours and then dissipated early on the 29<sup>th</sup>.

b. Meteorological Statistics

Observations in Carlos (Figs. 2 and 3) include satellite-based subjective Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB), the Satellite Analysis Branch (SAB) and the U. S. Air Force Weather Agency (AFWA). The estimate of 55-knot wind speeds at landfall was based primarily on the appearance of an eye-type feature on microwave imagery late on the afternoon before landfall (Fig. 4) and also on the appearance of a similar feature on radar images from the Puerto Angel radar.

Ship reports of winds of tropical storm force associated with Carlos are given in

Table 2, which lists three ships that came within about 50 nautical miles of the center of the tropical cyclone as it was approaching the coast and intensifying.

c. Casualty and Damage Statistics

No deaths were reported. According to the Associated Press, there were no reports of serious damage, but 44 sparsely populated coastal communities in the state of Oaxaca sustained some flooding, including downed power lines and phone service.

d. Forecast and Warning Critique

Carlos was a tropical cyclone for only 36 h, resulting in a small number of verifications and none beyond 36 hours. Average official track errors (with the number of cases in parentheses) were 79 (5), 157 (3), and 224 (1) n mi for the 12-, 24-, and 36-h forecasts, respectively<sup>1</sup>. These errors are considerably larger than the average official track errors for the 10-yr period 1993-2002 (39, 72, and 103 n mi, respectively). These large errors were the result of several west-northwestward track forecasts with forward speeds in the 10-knot range on the 26th. These forecasts compare with the slow northward drift that actually occurred. The cyclone did eventually turn toward the west-northwest, about 24 h later than forecast by either the guidance models or the official forecast.

Average official intensity errors were 12 (5), 12 (3), and 10 (1) knots for the 12, 24, and 36 hour forecasts, respectively. For comparison, the average official intensity errors over the 10-yr period 1993-2002 are 6, 11, and 15 knots, respectively.

Table 3 lists the watches and warnings associated with Carlos.

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<sup>1</sup> All forecast verifications in this report include the depression stage of the cyclone. National Hurricane Center verifications presented in these reports prior to 2003 did not include the depression stage.

Table 1. Best track data for Tropical Storm Carlos, 26-27 June 2003.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
26 / 0000	13.9	97.2	1007	25	tropical depression
26 / 0600	14.1	97.8	1006	30	"
26 / 1200	14.7	97.8	1003	35	tropical storm
26 / 1800	15.0	97.3	998	45	"
27 / 0000	15.7	97.6	996	55	"
27 / 0600	16.3	98.1	999	45	"
27 / 1200	16.5	98.6	1001	30	tropical depression
27 / 1800	16.7	99.3	1005	25	remnant low
28 / 0000	16.6	99.9	1008	25	"
28 / 0600	16.4	100.6	1008	25	"
28 / 1200	16.1	101.2	1008	25	"
28 / 1800	15.7	101.8	1008	25	"
29 / 0000	dissipated				
27 / 0000	15.7	97.6	996	55	minimum pressure
27 / 0300	16.0	97.8	996	55	landfall 50 n mi west of Puerto Escondido

Table 2. Selected ship reports with winds of at least 34 kt for Tropical Storm Carlos, 26-27 June 2003.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
26 / 1800	V7AM9	15.2	97.3	060 / 40	1005.8
26 / 2100	H9TA	14.7	97.1	200 / 37	1001.0
27 / 0000	NEPP	15.1	97.8	270 / 35	1006.0

Table 3. Watch and warning summary for Tropical Storm Carlos.

Date/Time (UTC)	Action	Location
26/0300	tropical storm warning in effect	Acapulco to Punta San Telmo
26/2100	tropical storm warning discontinued	Salina Cruz to Punta San Telmo
26/2100	tropical storm warning in effect	Zihuatanejo to Acapulco
27/0900	tropical storm warning discontinued	Puerto Angel to Salina Cruz
27/1500	all warnings discontinued	

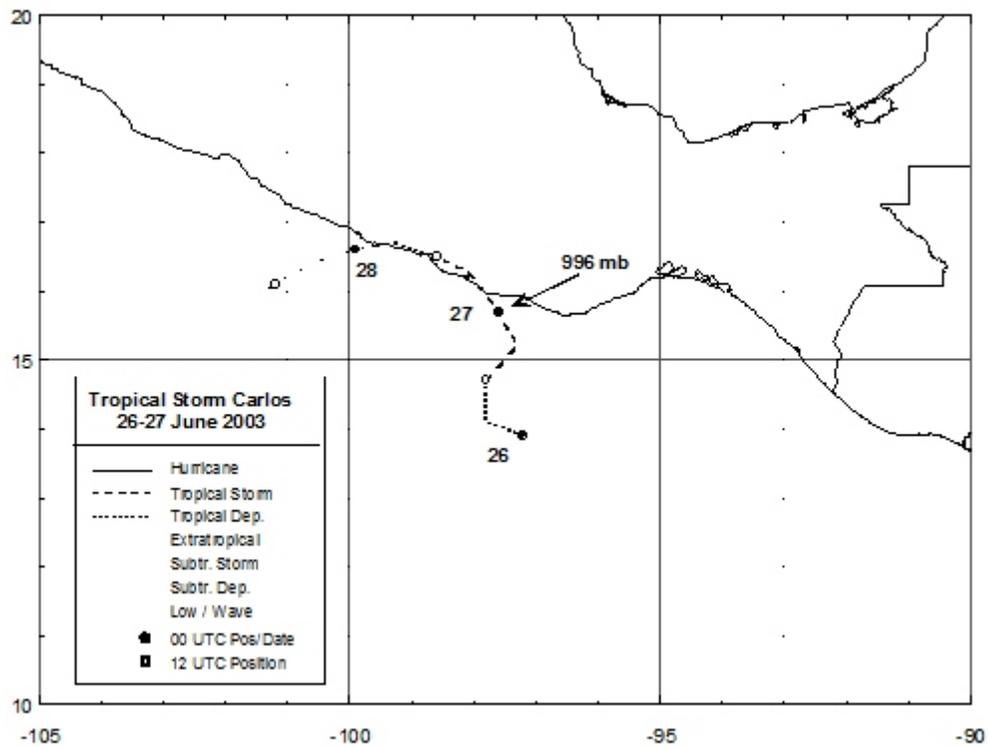


Figure 1. Best track positions for Tropical Storm Carlos, 26-27 June 2003.

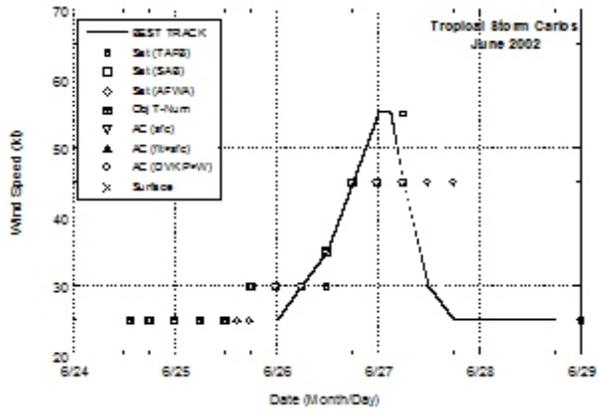


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Carlos.

Carlos.

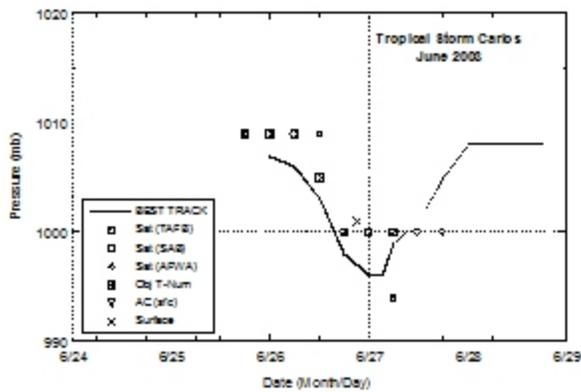


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Carlos.

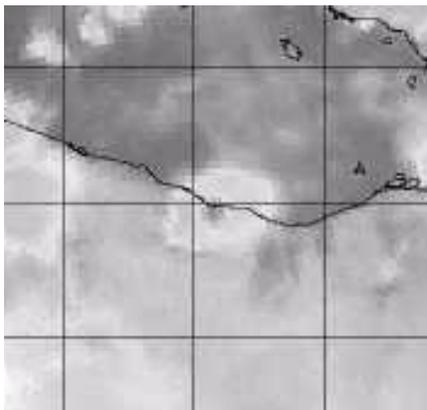


Fig. 4. Microwave image of Tropical Storm Carlos at 0220 UTC, 27 June 2003, showing the eye-type feature at the coast of Mexico (courtesy of Fleet Numerical Meteorology and Oceanography Center, U.S. Navy, Monterey, CA).